

A PARASITE OF THE TREE FERN (CYATHEA)

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(WITH PLATES XV, XVI)

Cyathea arborea (L.) J. E. Smith, one of the most beautiful of the Porto Rican tree ferns, is usually heavily infected by black fungous growths. Two collections of this fungus were made, one at Maricao, July 19, 1915, the other on El Alto de la Bandera, July 14, 1915.

On the older leaves the fungus is so abundant that the smallest frond segments, which measure about 3×7 mm., bear 25 or more of the black spots, and no segment is free of the fungus. On comparatively young fronds infections are less numerous, but even on such there are many fungous spots. A general idea of the appearance of the disease may be gained from figs. 1 and 2. The spots are often so abundant as to occupy considerably more than half of the leaf area. The individual spots are irregular in outline, and slightly elongated in a direction parallel with the veins of the host. The center of the spot is occupied by a conidiiferous structure, oblong, flattish, and dimidiate. This opens by an irregular crack, and in old pycnidia the whole top falls away (fig. 3). The cleavage lines seem to be determined by irregular rows of large cells. Immediately surrounding the pycnidium is seen a subiculum composed of close hyphae which appear to radiate much after the manner of the Microthyriaceae (fig. 4). Close focusing shows that this layer, instead of being superficial, is within the epidermal cells. Surrounding this epidermal subiculum is an area in which mesophyll cells alone are diseased. The diseased cells are dark brown and are quite filled with the coarse dark mycelium, while the adjacent cells are normal. In the cases of very young diseased spots, consisting of only a few cells, the infection is entirely in the mesophyll (fig. 19). It is only later that the central epidermal cells of a spot become invaded.

In microtome section these facts are verified: the mesophyll cells are seen to be invaded first, later the epidermal cells. Then the

fungus emerges and lays down a membrane one cell thick, of dark, thick-walled, closely woven hyphae. Under this arise in a close group numerous erect cells which in section appear like a palisade formation (fig. 6). These cells elongate; the covering layer becomes arched and eventually ruptures. The palisade-like cells are really conidiophores and bear the large, dark, 1-celled spores (fig. 8). The pycnidia are often sterile, the conidiophores then becoming greatly overgrown and distorted. The conidia germinate upon the surface of the leaf, producing at once an appressorium (fig. 9), which doubtless lends itself to the leaf invasion. This conidial structure is clearly of the *Leptostromataceae-Phaeosporae*, but does not fit well any of the form genera there given.

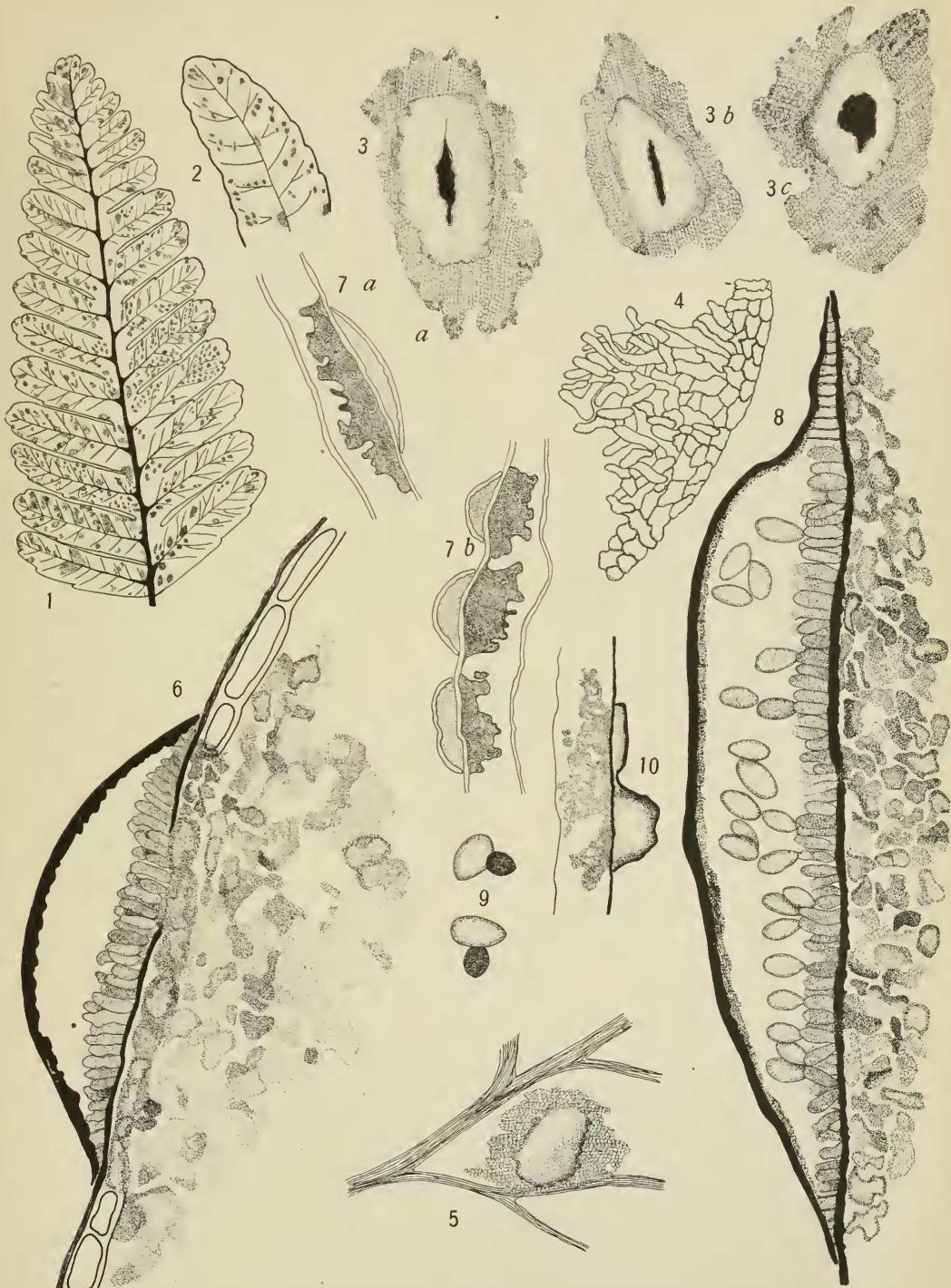
The infected spots give rise also to perithecia, although these are much less abundant. The perithecia at maturity are high and rounded (figs. 11*a*, 11*b*, 14, 15). The perithecial wall is composed of several layers of dark cells, compressed to a pseudo-parenchyma (fig. 12). The perithecia are uniform in shape, with a domed top; that they arise from the same mycelium which produces the pycnidia is clear (fig. 10). The young perithecia are indistinguishable from pycnidia, and indeed it appears that a pycnidium which is not yet sporiferous can develop into a perithecium. The first indication of differentiation is that in the perithecia a bed of closely packed hyaline mycelium develops between the cuticle and the covering. Soon the top begins to arch and to lay on internally added layers in thickness. The pycnidium covering is only one cell thick, the perithecium covering always several cells thick. At maturity the perithecial wall is lined by a layer several strands thick of felted hyaline mycelial threads. The asci, which are not numerous, arise basally, various ages side by side, and interspersed with numerous long mycelial threads (fig. 14) which may be regarded as paraphyses, although they are far from typical paraphyses in appearance. The basal structure of both the pycnidia and the perithecia consists of a dense mat of mycelium laid down in the epidermal cells. This structure is difficult to represent because in the growth process the epidermal cells are largely obliterated. The facts, however, are hinted at in figs. 6, 12, and 15. It is this epidermal subiculum which gives the radiating effect shown in fig. 18.

The questions of morphology and parasitism of this fungus are of especial interest. The morphological characters to be emphasized are the internal intracellular mycelium, the external fungous layer which becomes the cover of a dimidiate pycnidium, the dome-shaped, flat-bottomed perithecium with a wall several cells thick and without ostiole. The habit of the mycelium of completely filling certain cells or irregular groups of cells while intervening and adjacent cells are entirely free of mycelium is striking. The whole picture gives a group of characters difficult to place satisfactorily. The mycelial characters are Microthyriaceous, the absence of ostiole Perisporiaceous, and it might be possible to regard the perithecial cavity as being in a stroma and thus incline toward the Dothidiaceae. It is also possible, when the top is fallen out of the perithecium, to regard it as Phacidiaceous, and it is here that we would place it, although the mode of formation and of opening of the perithecium are not fully characteristic of that family. The genus *Rhagadolobium*, described on a tropical fern (HENNING and LINDAU in Engler's Jahrb. 23:288. 1896), presents certain similarities in the structure of the stroma, although it differs essentially in many ways, particularly in having the mycelium intracellular rather than intercellular, and in having 1-celled spores. In the Dothidiales the fungus resembles *Rhipidocarpon* Th. and Syd. in structure of the perithecium as seen in section, but the perithecium is not radial. In fact, it presents essential differences from all of the families of the Dothidiales as set up by THEISSEN and SYDOW. The fungus clearly shows differences from established genera sufficient to render its admission to any of them impossible. We therefore propose for it the new genus:

Griggsia, gen. nov.

Perithecia solitary, dimidiate, without ostiole, opening by irregular cleavage of the top, arising from a thin superficial and epidermal stroma, vegetative mycelium internal. Perithecial wall several cells thick. Asci basal, 8-spored. Spores oval, hyaline, 1-celled. Paraphyses hyaline, long, filamentous. Conidia in dimidiate pycnidia. Type species *Griggsia cyathea*. Named in honor of ROBT. F. GRIGGS.

Griggsia cyathea, sp. nov.—Perithecium dome-shaped, 200–300 μ in diameter, 150–160 μ high; wall about 24 μ thick on sides



STEVENS and DALBEY on GRIGGSIA